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The distribution of trees along Upper Skunk river, Iowa

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THE DISTRIBUTION OF TREES ALONG UPPER SKUNK RIVER, IOWA.

by

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The Distribution of Trees along Upper Skunk River, Iowa.

The distribution of trees along Skunk River is characteristic of the deciduous-forest-prairie transition, with narrow strips of timber along the water courses. The plants of this region have long since been listed and notation made of the sites they tend to occupy. The purpose of this paper is to present specific data as to relative abundance and distribution of tree species on Upper Skunk River, which is probably somewhat representative for central Iowa. The survey was conducted in Story County from Ames northward to Story City, a distance of about twelve miles. Since special interest attaches to the occurrence of an isolated patch of Quercitron oak (Quercus velutina Lam) some three miles northeast of Ames, closer attention was given this area and a study made of the relation of soil types to its distribution.

Literature.

The first contribution to the flora of Iowa was made by Bessey in 1871 (ref. 3), who gave locations of species by towns. This was followed in 1876 by a small volume by Arthur (ref. 1). Another general work is that of Greene, "Plants of Iowa" (ref. 8) which lists all species reported to 1907 but without locality. More valuable in this study are the catalog of Ames plants by Hitchcock (ref. 9) in 1890, and the "Flora of Story County" by Pammel (ref. 13). Ball (ref. 2) has discussed distribution of willows in Iowa, and T. J. and M. F. L.

Fitzpatrick (ref. 6) that of Juglandaceae, Betulaceae, and Fagaceae. Likewise Pammel has discussed the oaks (ref. 17) and the birches and maples (ref. 16). The distribution of native shrubs in Iowa is also well treated by Pammel (ref. 14), and localities are given. Numerous other papers have appeared on the floras of various parts of the state, but do not apply directly to this problem. Gray's Manual, seventh edition (ref. 7) has been freely used, and is followed as to nomenclature. Sargent's "Manual of Trees" (ref. 19) has been consulted, and reference has also been made to Pammel's lecture notes in Dendrology (ref. 12). Pammel's (ref. 15) ecological study of the flora of western Iowa has proved valuable, and especially his fine paper on "Comparative study of vegetation of swamp, clay, and sandstone areas" (ref. 11). Pammel, MacDonald, and Clark (ref. 15) have conducted a study similar to the present one, for western Iowa-the Missouri River Basin, and their paper has served partly as a guide. Physiography and geology of Story County have been discussed by Beyer. (ref. 4) General information on soil series and types were obtained from Soil Surveys of Hamilton (ref. 20) and Polk Counties (ref. 21), which join Story County on the north and south respectively.

Topography.

Story County was covered by the Wisconsin glacial drift, which leaves it a gently rolling surface, broken by the higher morainal deposits and the lower river valleys.

Skunk River flows in a general southerly direction, and has here only a hundred feet fall in twenty miles, this gradient being further reduced by countless meanders. The elevation of the area studied varies from 880 feet on Skunk River to 1060 feet on the Gary moraine, which is some four or five miles south of Story City. The upper valley is both narrow and shallow, the width averaging about a quarter and seldom reaching a half mile. At Story City the channel is scarsely more than thirty feet below the general upland. The channel deepens to the south, but the slopes are seldom a hundred feet high. At the great bend some two miles north of Ames, the valley widens perceptibly, and is nearly three miles across near the confluence with Squaw Creek southeast of Ames.

Within the area the principal tributaries are Keigley Branch and Bear Creek, which join Skunk River at the Gary moraine and are timbered only near the river.

Geology (ref. 4).

The physiographic features result almost entirely from the glacial deposits of Pleistocene times. Saint Louis limestone of the Lower Carboniferous formation is exposed at a few points along the river above the bend and has been quarried in years past. A little north of Gary moraine the limestone disappears beneath the Upper Carboniferous coal measures, which show a few feet exposure of alternating sandstone and shale a mile southeast of Story City. The youthfulness of

the upper valley demonstrates an effect of these rock layers.

Soils.

It is evident that the soils are derived almost entirely from the Wisconsin drift sheet, which attains a depth of twenty to eighty feet over the general upland. The county has not been covered by a detailed soil survey, but several characteristic types are known to occur. General grouping gives three classes according to their origin and location: drift soils, terrace soils, and bottomland. The drift soils occur on the uplands and slopes, and may contain various materials: clay, sand, gravel, boulders. The terrace soils are old bottomlands, now above overflow due to deepening of the river channel. The bottomland soils are alluvial deposits and usually loams or sandy loams with occasional gravel bars. Specific soil types near Ames are described later.

Climate.

The following data on climate of Ames were taken from U. S. Weather Bureau Reports (ref. 23), and include available records since 1895.

		Number of yrs. record
Mean temperature	48.2° F	16
Average maximum	98.4° F	23
Average minimum	-20.4° F	23
Precipitation	30.82 inches	19
Average snowfall	24.1 inches	14

Livingston and Shreve (ref. 10) have computed various data for Des Moines for a 31 year period:

Average date last frost in spring, April 22.

Average date first frost in autumn, October 10.

Length of average frostless season, 171 days.

Average normal daily temperature for coldest 14 days of year, 20° F.

Total normal precipitation for period of average frostless season, 21. 93 inches.

Mean normal daily precipitation for period of average frostless season, 0.128 inches.

Normal total annual precipitation, 32.45 inches.

Annual mean relative humidity, 71.1%.

Mean relative humidity for period of average frostless season, 68.5%.

Average annual wind velocity, 8.3 miles per hour.

Average velocity for period of average frostless season, 7.7 miles per hour.

Of these data the length of the average frostless season and the mean normal daily precipitation for that period are considered the best comparative indices of climatic conditions.

Methods.

In the tree survey, boundaries of the forested area were located mainly by topography on the Ames Quadrangle map, published by the U. S. Geological Survey. (Ref. 22). The scale

is about an inch to the mile, and with twenty foot contour intervals it was considered sufficiently accurate for this purpose.

Following the method used by Cowles (ref. 5) the tree cover was classified on the basis of physiographic features. The following societies are quite distinct: (1) bottomland, (2) terrace, (3) slope, (4) upland. Above the Gary moraine, the younger topography shows less abrupt changes, and hence separate data were obtained for areas (1) near Ames and (2) near Story City. Since the slopes near Ames are prominent, records were made for (1) south slopes, (2) north slopes, (3) east and west slopes. The trees of each species were counted on a large number of sample plots two rods square, and the percentage composition computed.

The distribution of Quercitron oak (Quercus velutina) was determined quite accurately and shown on a photographic enlargement of a portion of the Ames Quadrangle map. For this area a survey was made of soil types by ordinary methods, the subsoil being examined to thirty six inch depths at numerous borings. This oak occurs only on Carrington fine sandy loam; and for purposes of comparison, five representative soil types were chosen for securing soil temperatures and soil moisture determinations. Soil temperatures were measured with a standard centigrade thermometer at twelve inch and thirty six inch depths in the holes from which soil samples were taken. These

readings were made weekly at the following hours: (site 1) 7:30 A. M., (2) 6: 00 A. M., (3) 6:30 A. M., (4) 7:00 A. M., (5) 8:00 A. M. All the sites are in shade. The thermometer was inserted as quickly as possible after boring, and the hole covered. Seven minutes was found sufficient for the mercury to assume constant scale, and special precaution was taken to keep the bulb protected below the surface until after the reading. The holes were left covered and subsequent borings were made not closer than three feet.

The soil samples were taken at (1) 9 to 12 inch and (2) 33 to 36 inch depths, placed in air-tight cans and weighed at the laboratory within two hours. Fifty gram portions, in duplicate for each sample, were weighed out in little paper boxes (plate 4) and dried in an ordinary electric oven to air-dry condition. A Torsion balance was used and weight determined to tenths of grams. Percentages of moisture were computed on the basis of air-dry weight.

The tree societies.

The present boundaries of timbered areas are shown by dotted lines on plate 1. These were found not to conform accurately to the shaded portion of the map, and, indeed are undergoing constant change thru further clearing. The timber is shown to be a narrow belt largely under a mile in width. For the most part uplands and terraces have been cleared for farming, the some slopes are included both for tillage and pasture. The timbered area continues without distinct break

northward nearly halfway thru Hamilton County - to Sec.12 of T. 87 N. R. 4 W., some four miles northeast of Jewell. It is interesting to note that Keigley Branch and Bear Creek are not timbered very far above their confluences with Skunk River.

Table 1.

Percentage of trees near Ames.

	Bottomland	Terrace	Upland
Salix nigra	2.2		
Salix amygdaloides	1.5		
Salix longifolia	1.8		
Populus tremuloides			.5
Populus deltoides	2.9		
Juglans cinerea	1.0	8.7	.7
Juglans nigra	9.0	.8	
Carya ovata		4.5	22.7
Carya cordiformis	.9	1.0	
Ostrya virginiana		3.7	4.3
Quercus alba			19.2
Quercus macrocarpa	3.5	12.1	30.5
Quercus rubra	.7	11.0	7.7
Ulmus fulva	5.7	9.0	6.7
Ulmus americana	17.6	14.2	.5
Celtis occidentalis	4.0	1.0	
Platanus occidentalis	.4		
Pyrus ioensis			1.1
Crataegus punctata	1.4	2.1	.7
Crataegus mollis	1.8	3.9	
Prunus serotina	.1	.2	1.0
Prunus virginiana		.8	
Prunus americana			1.0
Gymnocladus dioica	2.3	.5	
Gleditschia triacanthos	1.8	.2	.2
Acer s. var. nigrum	.3	13.1	1.2
Acer saccharinum	12.6		
Acer negundo	7.3		
Tilia americana	4.8	9.7	1.8
Fraxinus p. var. lanceolata	7.8	1.3	
Fraxinus nigra	7.7	1.6	
Number of plots	84.	51.	68.

Table 2.

Percentage of trees near Ames.

	North slope	South slope	East and west slopes
Juniperus virginiana	.7		
Populus tremuloides	1.0		.3
Juglans cinerea	5.7	7.0	5.8
Carya ovata		18.3	2.2
Carya cordiformis			1.1
Ostrya virginiana	15.0	9.0	26.0
Quercus alba	1.0	6.9	5.4
Quercus macrocarpa	6.4	10.8	4.4
Quercus rubra	8.6	5.6	12.3
Ulmus fulva	12.1	22.1	11.2
Ulmus Americana	7.1	3.0	3.2
Amelanchier canadensis	7.1		4.0
Crataegus punctata	2.9	3.5	1.8
Crataegus mollis	2.1	1.3	
Prunus virginiana	6.4		3.2
Acer s. var. nigrum	9.0	6.9	9.8
Tilia americana	13.5	5.0	7.6
Fraxinus americana			.5
Fraxinus nigra	1.0		.7
Number of plots	48.	38.	85.

The percentages of tree species on sites near Ames are given in tables 1 and 2. On the bottomland American elm (Ulmus americana) predominates, with soft maple (Acer saccharinum), walnut (Juglans nigra), green ash (Fraxinus pennsylvanica var. lanceolata), black ash (Fraxinus nigra), and box elder (Acer negundo) common. On the lowest areas the willows are found, with soft maple, box elder, and cottonwood (Populus deltoides) on slightly higher ground. Ordinarily the stand is rather open, tho the cover may be dense. Prickly ash (Xanthoxylum americanum) and Missouri gooseberry (Ribes gracile), are common shrubs. In open stands, often the result of cutting, there are fine blue grass pastures. Other herbaceous plants are Parietaria pennsylvanica, nettle (Urtica gracilis), blue verbena (Verbena hastata), touch-me-not (Impatiens biflora), cup-plant (Silphium perfoliatum), and coneflower (Rudbeckia laciniata).

The terrace society continues to show a high percentage of American elm, but here appear also in quantity the hard maple (Acer saccharum var. nigrum), butternut (Juglans cinerea) and red oak (Quercus rubra). Bur oak (Quercus macrocarpa), red elm (Ulmus fulva), and basswood (Tilia americana) are much more prominent than on the bottomland. Prickly ash and Missouri gooseberry are the most common shrubs. Where cultivation does not follow clearing, hawthorne (Crataegus mollis and punctata) are common. The terrace shades into

bottomland on the one side; while the higher portions provide suitable sites for overlapping of slope species, and it is here that hard maple and red oak dominate. In moist situations the herbaceous cover is dense, and many spring flowers occur. Common species are Isopyrum biternatum, Geum canadense, dog-tooth violet (Erythronium americanum), spring beauty (Claytonia virginica), hepatica (Hepatica triloba), rue anemone (Anemonella thalictroides), mandrake (Podophyllum peltatum), water leaf (Hydrophyllum virginianum), Dutchman's breeches (Dicentra cucullaria), violet (viola cucullata), meadow rue (Thalictrum dasycarpum).

Many of the above flowering plants occur on the slopes, where other typical species are columbine (Aquelegia canadensis), catchfly (Silene stellata), and anemone (Anemone virginiana). The typical slope has a dense cover of hop hornbeam (or ironwood, Ostrya virginiana), hard maple, red oak, and red elm with much undergrowth. The hop hornbeam, while showing a high percentage, is a small tree and forms a smaller part of the cover than the figures indicate. Basswood is usually prominent, as also butternut. On gentler slopes the cover is often less dense, and bur oak is a dominant species. The moister sites tend to invite the terrace species, while the more exposed situations are better adapted to upland forms as bur oak, white oak (Quercus alba) and shagbark hickory (Carya ovata), which make quite a showing in places. Choke

cherry (Prunus virginiana) and service berry (Amelanchier canadensis) are typical slope species, and often occur near the brow. A few slopes have been cleared for farming, but danger from erosion presents a difficult problem. Careful planning of cutting and pasturing are necessary for establishment of blue grass and white clover (Trifolium repens) pasture, without erosion becoming serious.

The upland society has three dominant species: bur oak, shagbark hickory, and white oak. It is here that man has encroached most on the forest domain for his farming land. Judging from the remaining trees, white oak has suffered most in the cutting, and there are, indeed, but few good patches of this valuable species remaining. Where tillage has not followed clearing, the forest is struggling to restore its cover and thickets occur of hazelnut (Corylus americana), plum (Prunus americana), and Iowa crab apple (Pyrus ioensis), with sometimes chokecherry and wild red cherry (Prunus pennsylvanica) near the slopes. Black raspberries (Rubus occidentalis) and Missouri gooseberry are also found. Bluegrass is the common ground cover, and such other species occur as Sphenopholis obtusata, alum root (Heuchera villosa), verbena (Verbena stricta), lobelia (Lobelia spicata), and crowfoot (Geranium maculatum). On particularly dry exposures there occur sedge (Carex pennsylvanica), antennaria (Antennaria plantaginifolia), and andropogon (Andropogon scoparius). Cutting and

heavy pasturage together threaten the ultimate destruction of the upland forest.

Table 3.

Percentage of trees near Story City.

	Bottomland	Terrace	Slopes	Upland
Salix nigra	1.1			
Salix amygdaloides	1.2			
Salix longifolia	1.9			
Populus tremuloides			1.8	1.3
Populus deltoides	2.1			
Juglans cinerea	2.0	4.9	3.9	7.4
Juglans nigra	3.6	1.2		
Carya ovata		3.2	.8	12.2
Carya cordiformis	.5	.4	.6	.9
Ostrya virginiana		2.4	27.1	5.2
Quercus macrocarpa	6.8	27.7	3.3	32.1
Quercus rubra	3.7	9.0	8.9	12.1
Ulmus fulva	4.3	11.2	11.9	11.5
Ulmus americana	12.1	6.8	2.6	7.0
Celtis occidentalis	6.0	2.1	.2	
Pyrus ioensis	.7			
Amelanchier canadensis			1.3	
Crataegus punctata	.7	1.2	1.0	
Crataegus mollis	4.3	2.7	.6	1.3
Prunus serotina	.3			
Prunus virginiana		.3	1.6	
Prunus americana	.2			
Gymnocladus dioica	.3	.4		
Gleditschia triacanthos	.5	.2		
Acer s. var. nigrum	2.1	7.2	18.8	1.7
Acer saccharinum	8.0			
Acer negundo	10.3	.8	.3	.9
Tilia americana	9.1	8.8	14.5	6.5
Fraxinus p. var. lanceolata	9.9	5.4		
Fraxinus nigra	8.3	3.6		
Number of plots	64.	46.	42.	26.

Nearer Story City the tree types are less distinctive, and overlapping is more common. On the bottomland American elm, box elder, green ash, black ash, basswood, and soft maple are all important, with bur oak and hackberry (Celtis occidentalis) ranking next. Bur oak increases in importance, and on the terrace is the outstanding species. The other prominent terrace species are red elm, red oak, basswood, and hard maple. The important slope species are hop hornbeam, hard maple, basswood, and red elm. The slopes are largely along the river and short. The upland is not comparable to that farther south, and displays few sites as dry as the oak-hickory types near Ames. Bur oak constitutes nearly one third of the stand, and is associated with shagbark hickory, red oak, and red elm. Special search did not reveal any white oak in this vicinity. The same distribution of species seems to hold farther up the river and the final stand is of green ash box elder, cottonwood, willows, and dogwood.

Practically all of the forested areas are pastured, principally by cattle and hogs, and there is noticeable lack of tree reproduction on all sites. Quite a few elm seedlings were found in spots, but the younger forest growth shows that sprouting has played an important part. It is surprising that such heavy pasturage is practised with hogs, especially, as the well-known result in such cases is destruction of the sod as well as prevention of tree reproduction.

Quercitron oak area.

The occurrence of Quercitron oak near Ames is of very great interest. It is commonly not distinguished from red oak, tho the characters are quite prominent. The leaves are shiny on the upper surface and usually pubescent on the lower with tufts of rusty hairs in the axils of the main veins. The buds are larger than the red oak and pubescent. The cup is turbinate and covers about half the acorn. The inner bark is bright yellow. This species is sparsely distributed in Iowa, being reported by Pammel (ref. 12) in Fremont and Audubon counties to the southwest, Marshall and Linn to the east, Louisa and Muscatine southeast, and Clayton and Allamakee in the northeast corner, in addition to this one area near Ames - the only patch known in Story County. The distribution within this area is shown on plate 2. The densent stand occurs in the north part of section 36 and the southwest of section 25. A scattering is found as far north as section 23 making the area some three miles long with the greatest width slightly over a half mile. Three isolated trees were located in section 27, these being the only specimens found west of the river. Commonly associated with the Quercitron oak are bur oak, red oak, and slippery elm. The Quercitron predominates in a few places, but toward the outskirts of its distribution there are only scattered trees.

The Quercitron oak had been observed by Dr. Pammel

to occur on sandy soil. To determine whether its distribution shows correlation with soil type, a survey was made of soil types of this and adjacent areas. The resulting map is included as plate 3. The sandy soil was identified as Carrington fine sandy loam, and has a surface soil of grayish-brown color. Apparently deposited by a glacial stream, this type shows decided lack of uniformity as to depth, and also occasionally contains boulders and spots showing a fair amount of fine gravel. Typical sites have a subsoil of light grayish-brown to yellowish sand to three feet depth, such occurring on the upland portions of the type in section 36. But a large part of the area has less than three feet of sand, and is underlaid by yellowish-brown boulder clay (the same subsoil as Carrington loam), this being designated as Carrington fine sandy loam - shallow phase. It was considered impracticable to attempt segregation on the map of the regular type and the shallow phase. However in section 36, the transition follows topography quite regularly, the upland portions showing full three feet of sand which decreases in depth gradually down the slopes. In the south part of section 25, some of the slopes show sandy subsoil, but north and northwest the shallow phase obtains exclusively, appearing also in section 27 west of the river, where it is bordered on the south by Miami loam.

The principal upland soil in the vicinity is Carrington loam, which has some twelve inches of dark brown loam at the surface and a yellowish-brown boulder clay subsoil. This bounds the Carrington fine sandy loam type on the north, east, and south.

In section 36 narrow strips of muck extend up the drainage channels, on one of which three distinct bogs occur.

The broad bottomland is Wabash silt loam, dark brown in color, and has been cultivated since being drained.

A site on the bottomland in section 1 a few rods southwest of the road bridge was identified as Cass sandy loam, and is of dark gray color to three feet depth.

The distribution of the Quercitron oak shows a beautiful correlation with the occurrence of the Carrington fine sandy loam. The densest stands are found on typical sites where the sand is deep, while the percentage decreases noticeably with the reduced depth of sand. On the shallow phase north of the road in section 25, however, a fairly dense stand is found, mostly sprouts. In only one place does this oak spread beyond the fine sandy loam, this exception being three specimens in a bit of woodland on Carrington loam in the northwest part of section 25 near the road. It is also interesting to note that very little white oak occurs in this area, and then only on the shallow phase with the boulder clay subsoil.

Soil moisture and soil temperatures.

Five typical sites in different soil types were chosen for comparison of soil moisture and soil temperature. The location of these is shown by numbers (in green ink) on plate 2. The sites are:

1. Carrington loam.
2. Carrington fine sandy loam.
3. Muck.
4. Carrington fine sandy loam - shallow phase.
5. Cass sandy loam.

Site 1 is in the upland society, and has the following tree cover: shagbark hickory 33.3%, white oak 23.8, bur oak 14.3, red oak 14.3, hawthorn 9.4, and black cherry 4.7%.

Site 2 shows sand to three feet depth, and has Quercitron oak 46.4%, bur oak 42.8, and red elm 10.7%. There are red oak and a few aspen not far distant, and Virginia creeper (Psedera quinquefolia) grape (Vitis vulpina), heal-all (Prunella vulgaris), bedstraw (Galium concinnum), and a few small plants of hemp (Cannabis sativa) occur. Several elm seedlings were noticed.

Site 3 is the rich muck soil of a draw, and not far from a bog. It supports several black ash and a dense stand of hemp (Cannabis sativa), which is already five to six feet high.

Site 4 is on a steep northwest slope with basswood 56%, hop hornbeam 13.3, red elm 13.3, red oak 5.3, service berry 5.3, hard maple 4.0, and butternut 2.6%.

Site 5 is on the river bottom, some six rods from the stream and supports hackberry 33.3%, American elm 26.6, walnut 20., red elm 6.6, bur oak 6.6, and green ash 6.6%. Considerable blue grass occurs, and also ironweed (Vernonia fasciculata), pigweed (Chenopodium Boscianum), and peppergrass (Lepidium virginicum).

The figures on moisture content of these five soil types are given in table 5. It is interesting that the Carrington fine sandy loam has a noticeably lower water content than the other types. A photograph of the dried samples is included as plate 4.

Table 4.

Soil Moisture.

By percentage based on dry weight.

Site at 12 inch depth					
	June 16	June 22	June 30	July 6	Average
1	18.6	16.8	14.1	13.9	15.8
2	11.6	9.1	7.1	8.2	9.0
3	94.5	91.6	66.7	84.5	84.3
4	15.7	13.9	12.5	15.6	14.4
5	16.3	17.1	19.7	16.7	17.4

Site at 36 inch depth.					
	June 16	June 22	June 30	July 6	Average
1	14.4	13.0	10.4	10.8	12.1
2	9.3	7.6	9.8	3.6	7.6
3	23.1	26.5	23.7	23.3	24.1
4	12.3	12.0	11.6	11.3	11.8
5	9.5	4.7	10.9	4.9	7.5

The soil temperatures are given in table 5. For comparison air temperatures and precipitation data are presented in table 6 for the period in which these observations of soil temperatures and moisture were made.

It is realized that this part of the work was conducted for too short a period to be of value other than as a rough index for comparison of the sites in connection with these factors.

Table 5.

Soil Temperature.

(Centigrade)

Site at 12 inch depth.					
	June 16	June 22	June 30	July 6	Average
1	18.0	18.0	17.0	19.5	18.1
2	17.5	19.0	16.5	19.0	18.0
3	16.0	18.0	15.0	17.5	16.6
4	16.0	19.5	15.5	18.5	17.4
5	16.0	20.0	18.0	20.0	18.5

Site at 36 inch depth.					
	June 16	June 22	June 30	July 6	Average
1	16.0	15.5	17.0	16.0	16.1
2	14.5	16.0	16.0	17.0	15.9
3	12.0	13.5	13.5	14.0	13.2
4	14.0	16.0	15.5	16.0	15.4
5	15.0	17.0	17.0	17.5	16.6

Table 6.

Air temperatures and precipitation at Ames.

(Iowa State College Record.) (Fahrenheit.).

	FOR DAY		FOR PREVIOUS WEEK			
	Maximum	Minimum	Average Maximum	Average Minimum	Average Mean	Precipitation inches
June 15	85.	63.	73.6	56.1	64.8	1.55
June 21	91.	70.	88.4	67.4	77.8	0.
June 29	71.	55.	83.1	59.3	71.2	2.36
July 5	90.	72.	79.6	61.3	70.5	T
Centigrade equivalents for comparison.						
June 15	29.4	17.2	23.1	13.4	18.2	
June 21	32.8	21.1	31.3	19.7	25.4	
June 29	21.7	12.8	28.4	15.2	21.8	
July 5	32.2	22.2	26.4	16.3	21.4	

Notes on tree species.

Juniperus virginiana.

An escape from cultivation, and usually on slopes. Rare, and mostly small trees.

Salix nigra.

Common on the river banks.

Salix amygdaloides.

Fairly common and found with black willow.

Salix longifolia.

A shrub or small tree along the streams. Sometimes a foot in diameter. Shrubby on sites like clay banks.

Populus alba.

An escape from cultivation, but rarely occurring in this manner.

Populus tremuloides.

Infrequent, tho many specimens were noted on slopes and moist uplands. Seldom over six inches in diameter.

Populus grandidentata.

Reported along bluffs of Skunk River, but is rare.

Populus deltoides.

A large tree common on river bottoms and occurring up moist draws. Specimens were seen four feet in diameter.

Juglans cinerea.

A typical terrace and slope species, tho occurring sparsely on bottomland and moist uplands. To two feet diameter.

Juglans nigra.

A typical bottomland species where it is prominent. Occurs less frequently on terraces, and is grown successfully on upland soils. Specimens were measured twenty four to thirty inches in diameter.

Carya ovata.

Typical upland tree of dry habitats, associated with white oak and bur oak. Seldom over twenty inches in diameter.

Carya cordiformis.

Occurring sparsely on slopes and terrace. Sometimes eighteen inches in diameter.

Ostrya virginiana.

Dominant species of slopes, usually under six inches diameter and with crooked trunk.

Quercus alba.

Typical dominant of uplands. Has been extensively cut, and but few large trees remain. Specimens were seen twenty four and thirty inches in diameter. Found very rarely on lower slopes.

Quercus macrocarpa.

Commonest tree of the area studied. Abundant on uplands, but occurring also on slopes, terraces, and bottomlands. A large river-bottom specimen near Ames measures forty four inches in diameter.

Quercus rubra.

Common on higher terraces, slopes and moist uplands. Usually under two feet diameter.

Quercus velutina.

Occurring on an area of sandy soil northeast of Ames. Upland and slope species, some specimens measuring thirty inches diameter. Associated with bur oak, red oak, red elm.

Ulmus fulva.

Abundant on slopes and terraces and found less frequently on moist uplands and on bottomlands, to two feet diameter.

Ulmus americana.

Bur oak and American elm are the two most abundant trees of the region. A dominant species on bottomland and terrace. Specimens measure forty eight inches in diameter.

Ulmus racemosa.

The cork elm occurs sparingly on a small area northeast of Ames and west of the river.

Celtis occidentalis.

Common on bottomlands, tho stragglers are found even on the upland. Usually under twenty four inches diameter.

Platanus occidentalis.

Occurs rarely near Ames, on bottomland. A farmer reported two on his property two miles south of Story City, but this was not verified.

Pyrus ioensis.

Usually a small tree of the uplands, and a frontier species. A beautiful flowering tree.

Amelanchier canadensis.

A typical slope species, seldom as large as eight or ten inches diameter and often branched at the base.

Crataegus punctata.

A hillside and terrace species, and a beautiful ornamental.

Crataegus mollis.

Frequent on the lowlands and terraces. A small tree.

Prunus serotina.

Occurring sparingly on upland, slopes, and terrace. Usually under a foot in diameter.

Prunus virginiana.

Rather a shrubby growth on slopes.

Prunus pennsylvanica.

Observed only in section 36 of Milford township, where the stems were three or four inches thick.

Prunus americana.

Forming thickets along fence rows - largely shrubby.

Gymnocladus dioica.

Occurring on bottomlands and not very common. Usually under fifteen to eighteen inches diameter.

Gleditschia triacanthos.

A typical bottomland species, not uncommon. Occasionally on upper slopes. To two feet diameter.

Acer saccharum var. nigrum.

A beautiful tree of the upper terraces and slopes. Rarely to two feet diameter. Tapped for syrup by a few farmers.

Acer saccharinum.

A dominant bottomland species as large as three feet diameter.

Acer negundo.

Abundant on bottomlands, and tending to spread somewhat to higher sites.

Tilia americana.

Abundant on terraces and slopes. Often branched at base. To twenty inches diameter.

Fraxinus americana.

Very rare on slopes near Ames.

Fraxinus pennsylvanica var. lanceolata.

A dominant species of the bottomland. Usually not over twelve or fourteen inches diameter.

Fraxinus nigra.

Also prominent on river bottoms, tho tending to spread somewhat up moist rich water channels. Seldom over fifteen inches diameter.

List of trees and shrubs.

Pinaceae	
Juniperus virginiana L.	Red cedar
Liliaceae	
Smilax herbacea L.	Carrion flower
" rotundifolia L.	Green brier
Salicaceae	
Salix nigra Marsh	Black willow
" amygdaloides Anders.	Peach-leaved willow
" longifolia Muhl.	Sand-bar willow
" cordata Muhl.	Willow
" discolor Muhl.	Pussy willow
" humilis Marsh.	Prairie willow
" candida Fluegge	Hoary willow
Populus alba L.	White poplar
" tremuloides Michx.	American aspen
" grandidentata Michx.	Large-toothed aspen
" deltoides Marsh.	Cottonwood.
Juglandaceae	
Juglans cinerea L.	Butternut
" nigra L.	Black walnut
Carya ovata (mill.) K. Koch.	Shag-bark hickory.
" cordiformis (Wang.)K. Koch	Bitternut hickory
Betulaceae	
Corylus americana Walt.	Hazelnut
Ostrya virginiana (Mill.)K.Koch.	Hop hornbeam

Fagaceae	
Quercus alba L.	White oak
" macrocarpa Michx.	Bur oak
" rubra L.	Red oak
" velutina Lam.	Quercitron oak
Urticaceae	
Ulmus fulva Michx	Red elm
" americana L.	American elm
" racemosa Thomas	Cork elm
Celtis occidentalis L.	Hackberry
Menispermaceae	
Menispermum canadense L.	Moonseed
Saxifragaceae	
Ribes Cynosbati L.	Prickly gooseberry.
" gracile Michx.	Missouri gooseberry
" floridum L'Her.	Black currant
Platanaceae	
Platanus occidentalis L.	Sycamore
Rosaceae	
Pyrus ioensis (Wood) Bailey.	Iowa crab apple.
Amelanchier canadensis (L) Medic.	Service berry
Crataegus	
" punctata Jacq.	Hawthorn
" mollis (T. & G.) Scheele.	Hawthorn
Rubus idaeus L. var. aculeatissimus (C.A. Mey.) Regel & Tiling.	Wild red raspberry

Rubus occidentalis L.	Black raspberry
" sativus (Bailey) Brainerd.	Blackberry
Rosa pratincola Greene	Prairie rose.
Prunus serotina Ehrh.	Wild black cherry
" virginiana L.	Choke cherry
" pennsylvanica L.	Wild red cherry
" americana Marsh.	Wild plum
Leguminosae	
Gymnocladus dioica (L.) Koch.	Kentucky coffee tree.
Gleditschia triacanthos L.	Honey locust
Amorpha canescens Pursh.	Lead plant
" fruticosa L.	False indigo
Rutaceae	
Xanthoxylum americanum Mill.	Prickly ash
Anacardiaceae	
Rhus glabra L.	Smooth sumach.
" Toxicodendron L.	Poison ivy.
Celastraceae	
Evonymus atropurpureus Jacq.	Burning bush
Celastrus scandens L.	Bitter-sweet
Aceraceae	
Acer saccharum Marsh var. nigrum (Michx. F.) Britton	Hard maple
" Saccharinum L.	Soft maple
" negundo (Moench) Koehne	Box elder

Rhamnaceae	
Ceanothus americanus L.	New Jersey tea
" ovatus Desf.	
Vitaceae	
Psedera quinquefolia (L.) Greene.	Virginia creeper
" quinquefolia Var. Saint-Paulii (Koehne & Graebner) Rehder.	Virginia creeper
Vitis vulpina L.	Wild grape
Tiliaceae	
Tilia americana L.	Basswood p 41
Cornaceae	
Cornus circinata L'Her.	Round-leaved dogwood
" asperifolia Michx.	Dogwood
" paniculata L'Her.	Dogwood p 21
" alternifolia L. f.	Dogwood
Oleaceae	
Fraxinus americana L.	White ash p 17
" pennsylvanica Var. lanceolata (Borkh.) Sarg.	Green ash p 17
" nigra Marsh	Black ash
Rubiaceae	
Cephalanthus occidentalis L.	Buttonbush
Caprifoliaceae	
Lonicera dioica L.	Honeysuckle
Symphoricarpos occidentalis Hook	Wolfberry

Viburnum	pubescens (Ait.) Pursh.	Downy arrow-wood
"	Lentago L.	Sheepberry
Sambucus	canadensis L.	Elder

Summary and Conclusions.

This paper presents data on the distribution of tree societies and tree species along upper Skunk River, Iowa. Percentages of species are given for the principal physiographic divisions, as also notes on the occurrence of species. This material does not lend itself readily to summary.

The Quercitron oak (Quercus velutina) is limited in distribution to a small area some three miles long and a half mile wide, about three miles northeast of Ames. The soil of this area is Carrington fine sandy loam, the sand varying in depth from a few inches to over three feet. With one minor exception, the Quercitron oak is confined to this soil type, and does not tend to spread to adjacent clay loam (Carrington loam).

Five distinctive soil types, including the two just mentioned, were studied as to water content and temperature over a short period. The results offer only an index for comparing these soils as to the two factors.

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Explanation of plates 1 to 4.

Plate 1. General map.

Forest growth on areas enclosed by dotted red lines.

Plate 2. Distribution of Quercitron oak. (Quercus velutina.)

Occurs within areas enclosed by dotted red lines.

Plate 3. Location of soil types.

Carrington fine sandy loam.-Within areas covered by slanted green lines.

Muck. - Within areas enclosed by red lines.

Carrington loam. - As labelled.

Wabash silt loam. - As labelled.

Miami loam. - As labelled.

Plate 4. Soil samples used for moisture determinations.

Site 1. Carrington loam.

Site 2. Carrington fine sandy loam.

Site 3. Muck.

Site 4. Carrington fine sandy loam-shallow phase.

Site 5. Cass sandy loam.

GRAPHY
E OF IOWA
ICAL SURVEY
AY, DIRECTOR

IOWA
AMES QUADRANGLE

R.23 W. 93° 30′ 42° 15′ T 86 N

S C O T T

Randall

Tiernagel School

Sjurson School

Espeland School

HAMILTON CO.

STORY CO.

Story City (BM 999)

Thorson School

Olson School

Dick Creek

Long Creek

MINNEAPOLIS AND ST LOUIS

Skunk River

Roland

T. 85 N.

Copenhagen School

West School

H O W A R D

Watkins Lake

Keigley Branch

Sheffield School

South School

Southeast School

Gilbert

Franklin School

Pleasant Grove School

North School

Indian Creek

N K L I N

Union School

Milford School

Center School

T. 84 N.

M I L F O R D

Bloomington

Bridwell School

South School

Shearer School

Skunk River

AMES (BM 921)

IOWA STATE COLLEGE

CHICAGO AND NORTHWESTERN

Norway School

Grant School

Red Eagle School

I N G T O N

G R A N T

Evergreen School

T. 83 N.

R.24 W. (Slater) 35′ R.23 W. 93° 30′ 42° 00′

Scale 62500

1 2 3 4 Miles

0 1 2 3 4 5 Kilometers

Contour interval 20 feet.

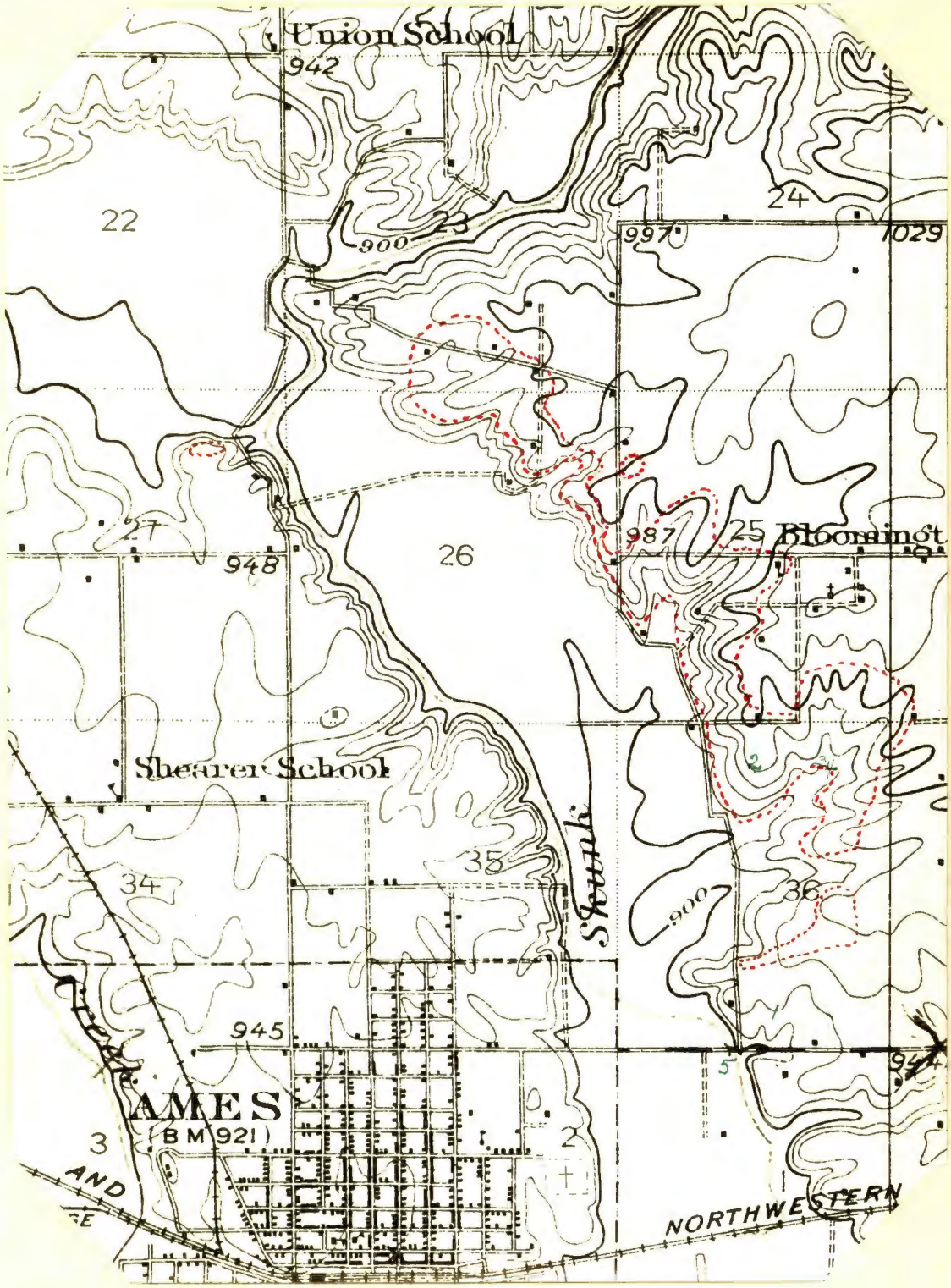
Datum is mean sea level.

TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION 1912.

Edition of Sept. 1914.

Plate 1.

AMES


Union School
942
22
900
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997
1029
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26
987
25
Bloomingt
Shearer School
35
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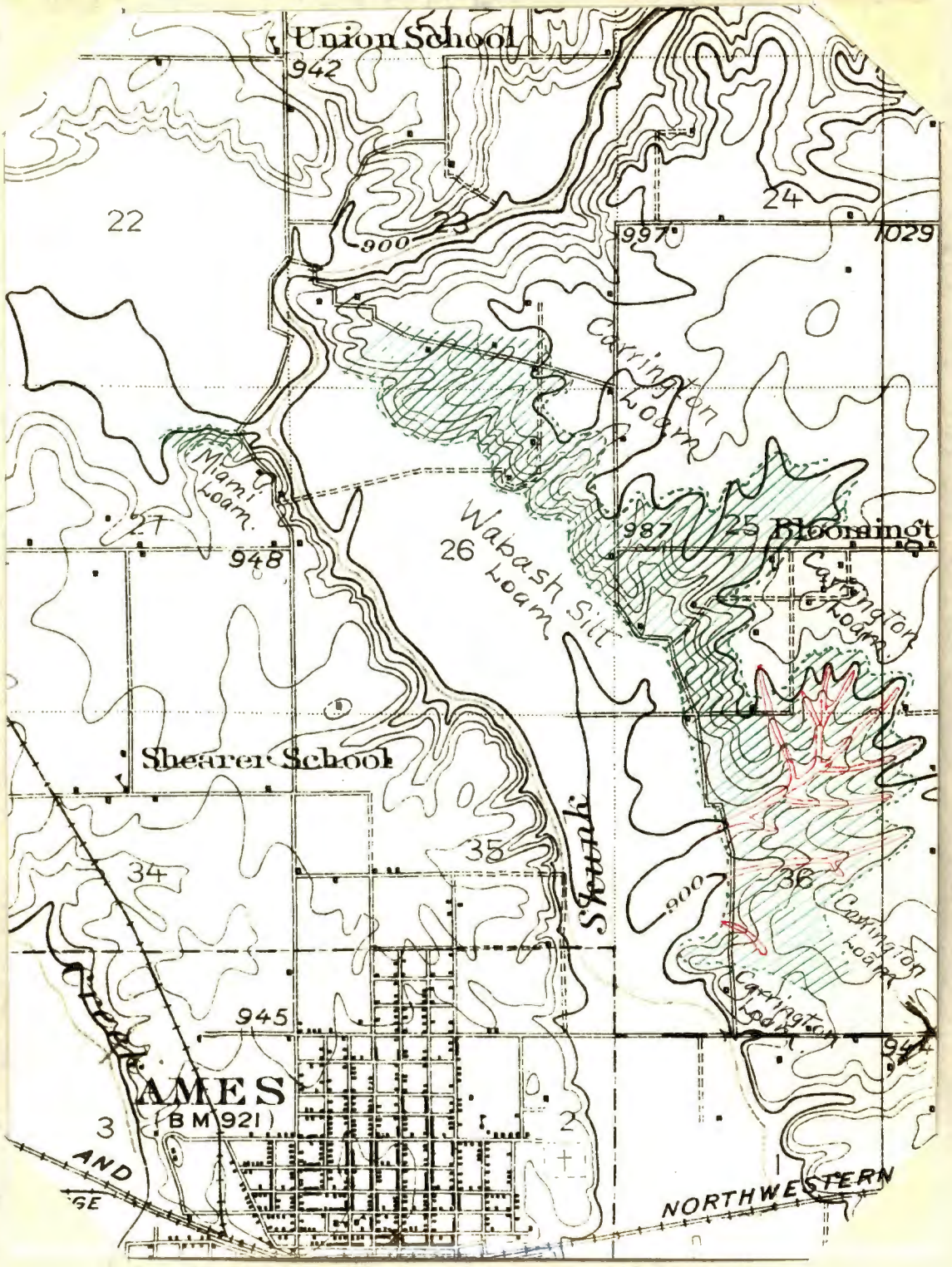
900
945
AMES
(B M 921)
3
2
5
AND
NORTHWESTERN

Plate 2.


Union School
942
22
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997
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Carrington Loam
Miami Loam
27
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987
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Bloomingt
Wabash Silt
26 Loam
Carrington Loam
Shearer School
35
34
36
Skunk
900
Carrington Loam
945
AMES
(B M 921)
3
2
AND
GE
NORTHWESTERN

Plate 3.

Duplicate samples
12 inch depth.

Duplicate samples
36 inch depth.

Site 1.

Site 2.

Site 3.

Site 4.

Site 5.

Plate 4.

Plate 5. General view near Ames.

Skunk River and bottomland in foreground.

Quercitron oak area in background.

Plate 6. General view of timbered area.

Plate 7. Bear Creek and a knoll of the Gary moraine.

Plate 8. A knoll of the Gary moraine.

Plate 9. Northern edge of timber
on Skunk River (Hamilton County.)

Plate 10. A clearing used for pasture.

Plate 11. A neglected clearing with young growth of elm.

Plate 12. Aspen (Populus tremuloides.)

Bur oak in background.

Plate 13. Natural graft of American elms.

Dr. L. H. Pammel.

(See plate 19.).

Plate 14. Giant American elm on bottomland.

Plate 15. Bur oak on bottomland.

Plate 16. Giant bur oak on bottomland near Ames.

(Location: section 35 of Franklin township.)

Plate 17. Giant bur oak.

Diameter 44 inches. (See plate 16.)

Plate 18. A native fence post of red oak.

Plate 19. Natural graft of American elms.
(Location: east of river on road south of section 30,
Howard Township.)

Plate 20. Black cherry (Prunus serotina) on upland.

Plate 21. White oak.

Plate 22. Quercitron oak (Quercus velutina).

Plate 23. Quercitron oak west of Skunk River.